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Title: Development of microbes assisted fruit crop production system

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Soil is an environmental medium, playing crucial role in global C cycle (soil C pool as the second biggest carbon pool), mainly through changes in soil fertility. Soil is, therefore, viewed as a part of climate change problem, but it can be a better part of the solution. Besides elevated CO2, changes in rainfall pattern and increase in average temperatures brought about by climate change with inflict over-riding effects on soil fertility changes vis-à-vis crop performance. Synergism between the effect of CO2 and nutrients is stronger under no water limiting conditions. However, such short term changes in fertility dynamics do not portray the long term effect either on soil fertility or on production responses, unless supported by defined analogues of soil and climate. Different fruit crops sequestering 24 – 109 tons CO2/ ha display their ability to moderate climate change-related issues on one hand, and elevate the crop fertilising ability for improved plant nutrition, besides water-use-efficiency, on the other hand. Therefore, response of different fruit crops under elevated CO2 condition is a function of nutrition status of the crop. Our studies demonstrated the maximum nutrient demand at fruit set stage (March-April for winter crop and August-September for summer crop under sub-humid tropical climate of central India). As per crop ontogeny unless there is some mitigation strategy available. Of late, certain citrus growing pockets of central India irrespective of orchard nutrient status (possibility of disturbed K metabolism), exhibited abnormal fruit growth (greater growth along equatorial than radial axis), the exact cause and effect relation still remains to be established. A large difference in fertility of two sites (Ustorthent versus Haplustert) indicated by a much greater increase in yield response at the low fertility soil site (Ustorthent) than the high fertility soil site (Haplustert), when added nutrient augmented to the same optimal fertility. But with climate change, such responses will be caused by nutrient limitation that can develop in poor fertility sites having shallow rooting depth. The recommended dose of fertilizers (RDF) worked out in 1990 – 91 is no longer effective now (2010 - 2015), due to rise in average temperature by 1.5 – 2.0 0 c during fruit set stage, necessitated addition of 25% more K to moderate such temperature stress in citrus. How does RDF behave in the long run in different crops?.

Better responsiveness of soil microbial biomass over chemically available nutrient pool to nutrient input, has led to renewed interest in measuring the quantum of nutrients held microbially. Long term data accrued on response of organic manuring versus inorganic fertilizers demonstrated that important soil quality indices like soil microbial diversity, soil microbial biomass nutrient (Cmic, Pmic, and Nmic) and organic carbon partitioning displayed significant changes, but without much difference in quantum of fruit yield. The efficacy of microbial consortium (Paneibacillus alvei (MF113275),

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Bacillus pseudomycoides (MF113272), Micrococcus yunnanesis (MF113274), Acinetobacter radioresistens (MF113273) and Aspergillus flavus (MF113270)) was tested successfully in both nurseries as well as well grown-up orchards as best management practice to cut down the rate of CO_2 release compared to inorganic fertilizers for storing larger proportion of plant-derived C in long term pools in the soil and reducing the exposure of such stored C to lesser decomposition, in addition to better post-harvest shelf life of citrus and other fruits. The other approaches involving multiple microbial inoculation along with enrichment of organic manures through inorganic fertilizers known as substrate have further been highlighted to provide an understanding of mechanism involved in C stabilization in soils for regulating soil C sequestration and associated nutrient dynamics under INM-based production system in perennial fruit crops. Crop-based adaptation strategies are needed keeping in view the nature of crop, its sensitivity level and the agro-pedological setup. Simultaneously, keeping an eye on carbon sink potential of different fruit crops vis-à-vis annual field crops will further aid in developing a blue print for redressal of climate change related issues for microbes assisted fruit crop production.

Biography

Born on January 5, 1963 at Varanasi (Uttar Pradesh) obtained M.Sc. (Ag) and Ph.D. in Soil Science from Banaras Hindu University in 1984 and 1988, respectively. Dr Srivastava is currently working as Principal Scientist (Soil Science) at ICAR - Central Citrus Research Institute, Nagpur for more than 32 years. Dr. Srivastava is a visiting Professor at Huazhong Agriculture University, Hubei and Yangtze University, Jingzhuo, China and Visiting Scientist at AREEO, Tehran, Iran. Dr Srivastava is credited with 161 research papers, 49 policy reviews, books like Advances in Citrus Nutrition by Springer-Verlag, Netherland and Diagnosis and Management of Nutrient Constraints in Fruit Crops by Elseviers, USA. Dr Srivastava is the recipient of awards like S.N.Ranade Award for Excellence in Micronutrient Research, FAI Silver Jubilee Award, International Plant Nutrition Institute-FAI Award, Fellow of 11 academic societies, including IAHS and Honorary Fellow of two academic societies.